

## STN SEARCH

10/695,980

FILE 'HOME' ENTERED AT 08:53:45 ON 14 JUN 2005

=&gt; file .nash

=&gt; s flavobacterium (3w) r1534

L1 1 FILE MEDLINE  
L2 3 FILE CAPLUS  
L3 1 FILE SCISEARCH  
L4 1 FILE LIFESCI  
L5 2 FILE BIOSIS  
L6 1 FILE EMBASE

TOTAL FOR ALL FILES

L7 9 FLAVOBACTERIUM (3W) R1534

=&gt; dup rem l7

PROCESSING COMPLETED FOR L7

L8 4 DUP REM L7 (5 DUPLICATES REMOVED)

=&gt; d ibib abs 1-4

L8 ANSWER 1 OF 4 BIOSIS COPYRIGHT (c) 2005 The Thomson Corporation on STN

ACCESSION NUMBER: 2001:463168 BIOSIS Full-text

DOCUMENT NUMBER: PREV200100463168

TITLE: Fermentative carotenoid production.

AUTHOR(S): Hohmann, Hans-Peter [Inventor, Reprint author]; Pasamontes, Luis [Inventor]; Tessier, Michel [Inventor]; van Loon, Adolphus [Inventor]

CORPORATE SOURCE: Frieberg, Germany  
ASSIGNEE: Roche Vitamins Inc.

PATENT INFORMATION: US 6207409 20010327

SOURCE: Official Gazette of the United States Patent and Trademark  
Office Patents, (Mar. 27, 2001) Vol. 1244, No. 4. e-file.  
CODEN: OGUPE7. ISSN: 0098-1133.

DOCUMENT TYPE: Patent

LANGUAGE: English

ENTRY DATE: Entered STN: 3 Oct 2001  
Last Updated on STN: 23 Feb 2002

AB Novel proteins of Flavobacterium sp. R1534 and the DNA sequences which encode these proteins are disclosed which provide an improved biosynthetic pathway from farnesyl pyrophosphate and isopentyl pyrophosphate to various carotenoid precursors and carotenoids, especially beta-carotene, lycopene, zeaxanthin and cantaxanthin.

L8 ANSWER 2 OF 4 CAPLUS COPYRIGHT 2005 ACS on STN

ACCESSION NUMBER: 1998:394053 CAPLUS Full-text

DOCUMENT NUMBER: 129:94523

TITLE: Recombinant preparation of carotenoids using enzymes  
from Flavobacterium or gram-negative bacteria strain  
E-396 for feed or food industries

INVENTOR(S): Pasamontes, Luis; Tosigonkov, Juri

PATENT ASSIGNEE(S): F. Hoffmann-La Roche A.-G., Switz.

SOURCE: Jpn. Kokai Tokkyo Koho, 80 pp.

CODEN: JKXXAF

DOCUMENT TYPE: Patent

LANGUAGE: Japanese

FAMILY ACC. NUM. COUNT: 1

PATENT INFORMATION:

PATENT NO.	KIND	DATE	APPLICATION NO.	DATE
JP 10155497	A2	19980616	JP 1997-348653	19971202
EP 872554	A2	19981021	EP 1997-120324	19971120
EP 872554	A3	20000607		
EP 872554	B1	20030611		
R: AT, BE, CH, DE, DK, ES, FR, GB, GR, IT, LI, LU, NL, SE, MC, PT, IE, SI, LT, LV, FI, RO				
AT 242812	E	20030615	AT 1997-120324	19971120
ES 2200110	T3	20040301	ES 1997-120324	19971120
BR 9705676	A	19990525	BR 1997-5676	19971201
US 6291204	B1	20010918	US 1997-980832	19971201

CN 1184159	A	19980610	CN 1997-122604	19971202
US 2003022273	A1	20030130	US 2001-920923	20010802
US 6677134	B2	20040113		
US 2004058410	A1	20040325	US 2003-695980	20031029
PRIORITY APPLN. INFO.:			EP 1996-810839	A 19961202
			US 1997-980832	A3 19971201
			US 2001-920923	A3 20010802

AB Disclosed is a method for industrial-scale production of carotenoids by expression of the Flavobacterium strain R1534- or gram-neg. bacteria strain E-396-derived genes that are associated with the carotenoids-biosynthesis in a transgenic host such as Escherichia coli or Bacillus subtilis. The genes involved are crtE (for geranylgeranyl pyrophosphate synthetase), crtB (phytoene synthetase), crtI (phytoene desaturase), crtY (lycopene cyclase), all from Flavobacterium strain R1534, and crtZE396 ( $\beta$ -carotene oxygenase) from gram-neg. bacteria strain E-396. Gene crtW encoding  $\beta$ -carotene  $\beta$ 4-oxygenase of Alcaligenes strain PC-1 may also be used to improve the carotenoids production. Methods for fermentation production of cantaxanthin, astaxanthin, adonixanthin, and zeaxanthin are claimed. Methods using genes crtEE396, crtBE396, crtIE396, crtYE396, crtZE396, and crtWE396, all from gram-neg. bacteria strain E-396, also claimed. Use of carotenoids as food or feed additives is also claimed.

L8 ANSWER 3 OF 4 CAPLUS COPYRIGHT 2005 ACS on STN

ACCESSION NUMBER: 1997:210987 CAPLUS Full-text  
DOCUMENT NUMBER: 126:198635  
TITLE: Recombinant preparation of carotenoids using Flavobacterium genes for feed or food industries  
PATENT ASSIGNEE(S): F. Hoffmann-La Roche & Co. AG, Switz.  
SOURCE: Jpn. Kokai Tokyo Koho, 88 pp.  
CODEN: JKXXAF  
DOCUMENT TYPE: Patent  
LANGUAGE: Japanese  
FAMILY ACC. NUM. COUNT: 1  
PATENT INFORMATION:

PATENT NO.	KIND	DATE	APPLICATION NO.	DATE
JP 09023888	A2	19970128	JP 1996-146862	19960610
EP 747483	A2	19961211	EP 1996-108556	19960529
EP 747483	A3	19970507		
EP 747483	B1	20040324		
R: AT, BE, CH, DE, DK, ES, FR, GB, IT, LI, NL				
AT 262590	E	20040415	AT 1996-108556	19960529
ES 2216027	T3	20041016	ES 1996-108556	19960529
US 6087152	A	20000711	US 1996-660645	19960607
US 6124113	A	20000926	US 1999-298718	19990423
US 6207409	B1	20010327	US 2000-546969	20000411
US 2002147371	A1	20021010	US 2000-547267	20000411
US 6613543	B2	20030902		

PRIORITY APPLN. INFO.:

EP 1995-108888	A	19950609
US 1996-660645	A3	19960607
US 1999-298718	A3	19990423

AB Disclosed is a method for industrial-scale production of carotenoids by expression of the Flavobacterium-derived genes that are associated with the carotenoids-biosynthesis in a transgenic host such as Escherichia coli or Bacillus subtilis. The genes involved are crtE (for geranylgeranyl pyrophosphate synthetase), crtB (phytoene synthetase), crtI (phytoene desaturase), crtY (lycopene cyclase), and crtZ ( $\beta$ -carotene oxygenase). Gene crtW encoding  $\beta$ -carotene  $\beta$ 4-oxygenase of Alcaligenes strain R1534 may also be used to improve the carotenoids production. Use of carotenoids as food or feed additives is claimed.

L8 ANSWER 4 OF 4 MEDLINE on STN DUPLICATE 1

ACCESSION NUMBER: 97186694 MEDLINE Full-text  
DOCUMENT NUMBER: PubMed ID: 9034310  
TITLE: Isolation and characterization of the carotenoid biosynthesis genes of Flavobacterium sp. strain R1534.  
AUTHOR: Pasamontes L; Hug D; Tessier M; Hohmann H P; Schierle J; van Loon A P  
CORPORATE SOURCE: F. Hoffmann-La Roche Ltd., Vitamins and Fine Chemicals

SOURCE: Division, Basel, Switzerland.. luis.pasamontes@roche.com  
Gene, (1997 Jan 31) 185 (1) 35-41.  
Journal code: 7706761. ISSN: 0378-1119.

PUB. COUNTRY: Netherlands  
DOCUMENT TYPE: Journal; Article; (JOURNAL ARTICLE)  
LANGUAGE: English  
FILE SEGMENT: Priority Journals  
OTHER SOURCE: GENBANK-U62808  
ENTRY MONTH: 199703  
ENTRY DATE: Entered STN: 19970327  
Last Updated on STN: 19970327  
Entered Medline: 19970317

AB The Gram-negative bacterium *Flavobacterium* sp. strain R1534 is a natural producer of zeaxanthin. A 14 kb genomic DNA fragment of this organism has been cloned and a 5.1 kb piece containing the carotenoid biosynthesis genes sequenced. The carotenoid biosynthesis cluster consists of five genes arranged in at least two operons. The five genes are necessary and sufficient for the synthesis of zeaxanthin. The encoded proteins have significant homology to the crtE, crtB, crtY, crtI and crtZ gene products of other carotenogenic organisms. Biochemical assignment of the individual gene products was done by HPLC analysis of the carotenoid accumulation in *Escherichia coli* host strains transformed with plasmids carrying deletions of the *Flavobacterium* sp. strain R1534 carotenoid biosynthesis cluster.

=> s microorganism e-396

L9 0 FILE MEDLINE  
L10 3 FILE CAPLUS  
L11 0 FILE SCISEARCH  
L12 1 FILE LIFESCI  
L13 1 FILE BIOSIS  
L14 0 FILE EMBASE

TOTAL FOR ALL FILES

L15 5 MICROORGANISM E-396

=> dup rem l15

PROCESSING COMPLETED FOR L15

L16 5 DUP REM L15 (0 DUPLICATES REMOVED)

=> d ibib abs 1-5

L16 ANSWER 1 OF 5 CAPLUS COPYRIGHT 2005 ACS on STN

ACCESSION NUMBER: 2005:281831 CAPLUS Full-text

DOCUMENT NUMBER: 142:315336

TITLE: Carotenoid manufacture with microorganism mutants

INVENTOR(S): Tsubokura, Akira; Yoneda, Hisashi; Hirasawa, Kazuaki

PATENT ASSIGNEE(S): Nippon Oil Corporation, Japan

SOURCE: PCT Int. Appl., 43 pp.

CODEN: PIXXD2

DOCUMENT TYPE: Patent

LANGUAGE: Japanese

FAMILY ACC. NUM. COUNT: 1

PATENT INFORMATION:

PATENT NO.	KIND	DATE	APPLICATION NO.	DATE
WO 2005028661	A1	20050331	WO 2004-JP13033	20040908
W:	AE, AG, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BW, BY, BZ, CA, CH, CN, CO, CR, CU, CZ, DE, DK, DM, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MA, MD, MG, MK, MN, MW, MX, MZ, NA, NI, NO, NZ, OM, PG, PH, PL, PT, RO, RU, SC, SD, SE, SG, SK, SL, SY, TJ, TM, TN, TR, TT, TZ, UA, UG, US, VZ, VC, VN, YU, ZA, ZM, ZW			
RW:	BW, GH, GM, KE, LS, MW, MZ, NA, SD, SL, SZ, TZ, UG, ZM, ZW, AM, AZ, BY, KG, KZ, MD, RU, TJ, TM, AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HU, IE, IT, LU, MC, NL, PL, PT, RO, SE, SI, SK, TR, BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG			
JP 2005087097	A2	20050407	JP 2003-325104	20030917

JP 2005087099 A2 20050407 JP 2003-325130 20030917  
 JP 2005087100 A2 20050407 JP 2003-325144 20030917  
 PRIORITY APPLN. INFO.: JP 2003-325104 A 20030917  
 JP 2003-325130 A 20030917  
 JP 2003-325144 A 20030917

AB The carotenoid-producing microorganism E-396 strain or A-581-1 strain with the 16S ribosome RNA gene given is subjected to mutation such as chemical mutagenesis to alter and/or enhance the production of carotenoids selected from zeaxanthin, astaxanthin,  $\beta$ -carotene, etc. Preparation of E-396 strain mutant that produces enhanced zeaxanthin by NTG chemical mutagenesis was shown.

REFERENCE COUNT: 22 THERE ARE 22 CITED REFERENCES AVAILABLE FOR THIS RECORD. ALL CITATIONS AVAILABLE IN THE RE FORMAT

L16 ANSWER 2 OF 5 CAPLUS COPYRIGHT 2005 ACS on STN

ACCESSION NUMBER: 2003:837277 CAPLUS Full-text

DOCUMENT NUMBER: 139:337015

TITLE: Producing canthaxanthin by mutagenesis of astaxanthin-producing soil bacteria *Paracoccus carotinifaciens*

INVENTOR(S): Hirasawa, Kazuaki; Tsubokura, Akira; Mizuta, Haruyoshi

PATENT ASSIGNEE(S): Nippon Oil Corporation, Japan

SOURCE: PCT Int. Appl., 20 pp.

CODEN: PIXXD2

DOCUMENT TYPE: Patent

LANGUAGE: Japanese

FAMILY ACC. NUM. COUNT: 1

PATENT INFORMATION:

PATENT NO.	KIND	DATE	APPLICATION NO.	DATE
WO 2003087358	A1	20031023	WO 2003-JP4398	20030407
W: AE, AG, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, BZ, CA, CH, CN, CO, CR, CU, CZ, DE, DK, DM, DZ, EC, EE, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MA, MD, MG, MK, MN, MW, MX, MZ, NI, NO, NZ, OM, PH, PL, PT, RO, RU, SC, SD, SE, SG, SK, SL, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, YU, ZA, ZM, ZW RW: GH, GM, KE, LS, MW, MZ, SD, SL, SZ, TZ, UG, ZM, ZW, AM, AZ, BY, KG, KZ, MD, RU, TJ, TM, AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HU, IE, IT, LU, MC, NL, PT, RO, SE, SI, SK, TR, BF, BJ, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG				
JP 2003304875	A2	20031028	JP 2002-112240	20020415
EP 1496115	A1	20050112	EP 2003-746432	20030407
R: AT, BE, CH, DE, DK, ES, FR, GB, GR, IT, LI, LU, NL, SE, MC, PT, IE, SI, LT, LV, FI, RO, MK, CY, AL, TR, BG, CZ, EE, HU, SK				
PRIORITY APPLN. INFO.:			JP 2002-112240	A 20020415
			WO 2003-JP4398	W 20030407

AB A process for producing canthaxanthin characterized by mutagenizing an astaxanthin-producing microorganism E-396 and A-581-1, selecting a mutant showing a ratio (% by mass) of the thus produced canthaxanthin to the total carotenoid yield higher than that of the parent strain, culturing the obtained canthaxanthin-producing strain and collecting canthaxanthin or a carotenoid mixture containing canthaxanthin from the culture medium thus obtained, is disclosed. Mutant strains giving the ratio of the carotenoid compds. (i.e.,  $\beta$ -cryptoxanthin, zeaxanthin, 3-hydroxyechinenone, asteroideone, adonirubin, adonixanthin, astaxanthin, etc.) to the total carotenoid yield below 20% are selected. The strain E-396T, isolated from soil, was Gram-neg., aerobic, orange-pigmented, rod-shaped, motile by peritrichous flagella and astaxanthin-producing. This organism produced carotenoids, mainly astaxanthin, and did not produce bacteriochlorophyll. Anal. of the 16S rRNA sequence of strain E-396T showed it to be a member of the  $\alpha$ -3 subclass of the Proteobacteria, forming a cluster with the species of the genus *Paracoccus*. On the basis of the production of orange pigments and motility by peritrichous flagella, together with DNA-DNA reassocn. data, it is concluded that the new isolate should be classified into a new species of the genus *Paracoccus*, *Paracoccus carotinifaciens* sp. nov. The type strain is E-396T (= IFO 16121T).

REFERENCE COUNT: 20 THERE ARE 20 CITED REFERENCES AVAILABLE FOR THIS RECORD. ALL CITATIONS AVAILABLE IN THE RE FORMAT

L16 ANSWER 3 OF 5 BIOSIS COPYRIGHT (c) 2005 The Thomson Corporation on STN

ACCESSION NUMBER: 2001:546427 BIOSIS Full-text

DOCUMENT NUMBER: PREV200100546427

TITLE: Fermentative carotenoid production.

AUTHOR(S): Pasamontes, Luis [Inventor, Reprint author]; Tsygankov, Yuri [Inventor]  
 CORPORATE SOURCE: Trimbach, Switzerland  
 ASSIGNEE: Roche Vitamins Inc.  
 PATENT INFORMATION: US 6291204 20010918  
 SOURCE: Official Gazette of the United States Patent and Trademark Office Patents, (Sep. 18, 2001) Vol. 1250, No. 3. e-file.  
 CODEN: OGUPE7. ISSN: 0098-1133.  
 DOCUMENT TYPE: Patent  
 LANGUAGE: English  
 ENTRY DATE: Entered STN: 21 Nov 2001  
 Last Updated on STN: 25 Feb 2002  
 AB Novel proteins of microorganism E-396 (FERM BP-4283) and the DNA sequences which encode these proteins have been discovered to provide an improved biosynthetic pathway from farnesyl pyrophosphate and isopentyl pyrophosphate to various carotenoids, especially zeaxanthin, astaxanthin, adonixanthin and canthaxanthin.

L16 ANSWER 4 OF 5 LIFESCI COPYRIGHT 2005 CSA on STN  
 ACCESSION NUMBER: 2002:60539 LIFESCI Full-text  
 TITLE: Fermentative carotenoid production  
 AUTHOR: Pasamontes, L.; Tsygankov, Y.  
 CORPORATE SOURCE: Roche Vitamins Inc.  
 SOURCE: (20010918) . US Patent: 6291204; US CLASS: 435/67; 435/132; 435/155; 435/252.33; 536/23.2.  
 DOCUMENT TYPE: Patent  
 FILE SEGMENT: W2  
 LANGUAGE: English  
 SUMMARY LANGUAGE: English  
 AB Novel proteins of microorganism E-396 (FERM BP-4283) and the DNA sequences which encode these proteins have been discovered to provide an improved biosynthetic pathway from farnesyl pyrophosphate and isopentyl pyrophosphate to various carotenoids, especially zeaxanthin, astaxanthin, adonixanthin and canthaxanthin.

L16 ANSWER 5 OF 5 CAPLUS COPYRIGHT 2005 ACS on STN  
 ACCESSION NUMBER: 1997:772393 CAPLUS Full-text  
 DOCUMENT NUMBER: 128:59314  
 TITLE: Carotenoid-stabilization material  
 INVENTOR(S): Tsubokura, Akira; Yoneda, Hisashi; Uchiyama, Yoko; Mizuta, Yoshitaka  
 PATENT ASSIGNEE(S): Nippon Oil Co., Ltd., Japan  
 SOURCE: Jpn. Kokai Tokkyo Koho, 14 pp.  
 CODEN: JKXXAF  
 DOCUMENT TYPE: Patent  
 LANGUAGE: Japanese  
 FAMILY ACC. NUM. COUNT: 1  
 PATENT INFORMATION:

PATENT NO.	KIND	DATE	APPLICATION NO.	DATE
JP 09308481	A2	19971202	JP 1996-128565	19960523
JP 3278574	B2	20020430		

PRIORITY APPLN. INFO.: JP 1996-128565 19960523

AB The title material (I) is produced by microorganism E- 396 or mutant microorganism A-581-1. I is useful for improvement/stabilization of meat, egg, and/or skin color. Physiol. and morphol. characteristics of the microorganism E- 396 were given.

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## WEST Search History

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DATE: Tuesday, June 14, 2005

<b>Hide?</b>	<b>Set Name</b>	<b>Query</b>	<b>Hit Count</b>
		<i>DB=PGPB; THES=ASSIGNEE; PLUR=YES; OP=ADJ</i>	
<input type="checkbox"/>	L7	L4 and l3	2
		<i>DB=USPT,USOC,EPAB,JPAB,DWPI; THES=ASSIGNEE; PLUR=YES; OP=ADJ</i>	
<input type="checkbox"/>	L6	L5 and l1	2
<input type="checkbox"/>	L5	e-396 and crtws4	4
		<i>DB=PGPB; THES=ASSIGNEE; PLUR=YES; OP=ADJ</i>	
<input type="checkbox"/>	L4	e-396 and crtws4	3
<input type="checkbox"/>	L3	flavobacterium adj3 r1534	3
		<i>DB=USPT,USOC,EPAB,JPAB,DWPI; THES=ASSIGNEE; PLUR=YES; OP=ADJ</i>	
<input type="checkbox"/>	L2	L1 and canthaxanthin	6
<input type="checkbox"/>	L1	flavobacterium adj3 r1534	6

END OF SEARCH HISTORY

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### Search Results - Record(s) 1 through 2 of 2 returned.

☐ 1. Document ID: US 20040058410 A1

L7: Entry 1 of 2

File: PGPB

Mar 25, 2004

PGPUB-DOCUMENT-NUMBER: 20040058410

PGPUB-FILING-TYPE: new

DOCUMENT-IDENTIFIER: US 20040058410 A1

TITLE: Fermentative carotenoid production

PUBLICATION-DATE: March 25, 2004

## INVENTOR-INFORMATION:

NAME	CITY	STATE	COUNTRY	RULE-47
Pasamontes, Luis	Trimbach		CH	
Tsygankov, Yuri	Moscow		RU	

US-CL-CURRENT: [435/67](#); [435/193](#), [435/252.3](#), [435/320.1](#)

Full	Title	Citation	Front	Review	Classification	Date	Reference	Sequences	Attachments	Claims	KIMC	Draw. De
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☐ 2. Document ID: US 20030022273 A1

L7: Entry 2 of 2

File: PGPB

Jan 30, 2003

PGPUB-DOCUMENT-NUMBER: 20030022273

PGPUB-FILING-TYPE: new

DOCUMENT-IDENTIFIER: US 20030022273 A1

TITLE: Fermentative carotenoid production

PUBLICATION-DATE: January 30, 2003

## INVENTOR-INFORMATION:

NAME	CITY	STATE	COUNTRY	RULE-47
Pasamontes, Luis	Trimbach		CH	
Tsygankov, Yuri	Moscow		RU	

US-CL-CURRENT: [435/67](#); [435/183](#), [435/252.3](#), [536/23.2](#)

Full	Title	Citation	Front	Review	Classification	Date	Reference	Sequences	Attachments	Claims	KIMC	Draw. De
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### Search Results - Record(s) 1 through 2 of 2 returned.

☐ 1. Document ID: US 6677134 B2

L6: Entry 1 of 2

File: USPT

Jan 13, 2004

US-PAT-NO: 6677134

DOCUMENT-IDENTIFIER: US 6677134 B2

TITLE: Fermentative carotenoid production

DATE-ISSUED: January 13, 2004

INVENTOR-INFORMATION:

NAME	CITY	STATE	ZIP CODE	COUNTRY
Pasamontes; Luis	Trimbach			CH
Tsygankov; Yuri	Moscow			RU

US-CL-CURRENT: [435/67](#); [435/183](#), [435/189](#), [435/232](#), [435/252.3](#), [435/252.33](#), [435/254.1](#),  
[536/23.2](#)

ABSTRACT:

Novel proteins of microorganism [E-396](#) (FERM BP-4283) and the DNA sequences which encode these proteins have been discovered to provide an improved biosynthetic pathway from farnesyl pyrophosphate and isopentyl pyrophosphate to various carotenoids, especially zeaxanthin, astaxanthin, adonixanthin and canthaxanthin.

6 Claims, 89 Drawing figures

Exemplary Claim Number: 1

Number of Drawing Sheets: 87

Full	Title	Citation	Front	Review	Classification	Date	Reference			Claims	KMAC	Draw D
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☐ 2. Document ID: US 6291204 B1

L6: Entry 2 of 2

File: USPT

Sep 18, 2001

US-PAT-NO: 6291204

DOCUMENT-IDENTIFIER: US 6291204 B1

**\*\* See image for [Certificate of Correction](#) \*\***

TITLE: Fermentative carotenoid production

DATE-ISSUED: September 18, 2001

## INVENTOR-INFORMATION:

NAME	CITY	STATE	ZIP CODE	COUNTRY
Pasamontes; Luis	Trimbach			CH
Tsygankov; Yuri	Moscow			RU

US-CL-CURRENT: 435/67; 435/132, 435/155, 435/252.33, 536/23.2

## ABSTRACT:

Novel proteins of microorganism E-396 (FERM BP-4283) and the DNA sequences which encode these proteins have been discovered to provide an improved biosynthetic pathway from farnesyl pyrophosphate and isopentyl pyrophosphate to various carotenoids, especially zeaxanthin, astaxanthin, adonixanthin and canthaxanthin.

3 Claims, 88 Drawing figures

Exemplary Claim Number: 1

Number of Drawing Sheets: 87

Full	Title	Citation	Front	Review	Classification	Date	Reference			Claims	KMC	Draw D
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### Search Results - Record(s) 1 through 4 of 4 returned.

☐ 1. Document ID: US 6677134 B2

L9: Entry 1 of 4

File: USPT

Jan 13, 2004

US-PAT-NO: 6677134

DOCUMENT-IDENTIFIER: US 6677134 B2

TITLE: Fermentative carotenoid production

DATE-ISSUED: January 13, 2004

## INVENTOR-INFORMATION:

NAME	CITY	STATE	ZIP CODE	COUNTRY
Pasamontes; Luis	Trimbach			CH
Tsygankov; Yuri	Moscow			RU

US-CL-CURRENT: [435/67](#); [435/183](#), [435/189](#), [435/232](#), [435/252.3](#), [435/252.33](#), [435/254.1](#), [536/23.2](#)

## ABSTRACT:

Novel proteins of microorganism [E-396](#) (FERM BP-4283) and the DNA sequences which encode these proteins have been discovered to provide an improved biosynthetic pathway from farnesyl pyrophosphate and isopentyl pyrophosphate to various carotenoids, especially zeaxanthin, astaxanthin, adonixanthin and canthaxanthin.

6 Claims, 89 Drawing figures

Exemplary Claim Number: 1

Number of Drawing Sheets: 87

Full	Title	Citation	Front	Review	Classification	Date	Reference	Claims	KMC	Draw D
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☐ 2. Document ID: US 6291204 B1

L9: Entry 2 of 4

File: USPT

Sep 18, 2001

US-PAT-NO: 6291204

DOCUMENT-IDENTIFIER: US 6291204 B1

**\*\* See image for Certificate of Correction \*\***

TITLE: Fermentative carotenoid production

DATE-ISSUED: September 18, 2001

## INVENTOR-INFORMATION:

NAME	CITY	STATE	ZIP CODE	COUNTRY
Pasamontes; Luis	Trimbach			CH
Tsygankov; Yuri	Moscow			RU

US-CL-CURRENT: 435/67; 435/132, 435/155, 435/252.33, 536/23.2

## ABSTRACT:

Novel proteins of microorganism E-396 (FERM BP-4283) and the DNA sequences which encode these proteins have been discovered to provide an improved biosynthetic pathway from farnesyl pyrophosphate and isopentyl pyrophosphate to various carotenoids, especially zeaxanthin, astaxanthin, adonixanthin and canthaxanthin.

3 Claims, 88 Drawing figures

Exemplary Claim Number: 1

Number of Drawing Sheets: 87

Full	Title	Citation	Front	Review	Classification	Date	Reference	Claims	RMIC	Draw D
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☐ 3. Document ID: JP 10155497 A

L9: Entry 3 of 4

File: JPAB

Jun 16, 1998

PUB-NO: JP410155497A

DOCUMENT-IDENTIFIER: JP 10155497 A

TITLE: PRODUCTION OF CAROTENOID BY IMPROVED FERMENTATION

PUBN-DATE: June 16, 1998

## INVENTOR-INFORMATION:

NAME	COUNTRY
LOUIS, PASAMONTE	
JULIJ, TOSHIGANKOV	

INT-CL (IPC): C12 N 15/09; C12 N 1/21; C12 N 9/02; C12 N 9/14; C12 N 9/88; C12 P 23/00

## ABSTRACT:

PROBLEM TO BE SOLVED: To efficiently produce the subject compound useful for foods, feeds, etc., by proliferating a cell transformed with a DNA containing a base sequence, etc., capable of coding for a GGPP synthase of *Flavobacterium* sp. R1534 and then separating the resultant product.

SOLUTION: A cell transformed with a DNA sequence such as a DNA sequence (crtE) capable of coding for a GGPP synthase of *Flavobacterium* sp. R1534, a DNA sequence (crtB) capable of coding for a prephytoene synthase of the strain, a DNA sequence (crtI) capable of coding for phytoene desaturase of the strain, a DNA sequence (crtY) capable of coding for lycopene cyclase of the strain or a DNA sequence (crtWE396) capable of coding for a  $\beta$ -carotene  $\beta$ 4-oxygenase of a microorganism E-396 (FERM BP-4283) or a vector containing the DNA sequence, etc., is cultured and the resultant product is then separated to efficiently produce the objective

canthaxanthin.

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Full	Title	Citation	Front	Review	Classification	Date	Reference	Claims	NAME	Draw D
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4. Document ID: ES 2200110 T3, JP 10155497 A, EP 872554 A2, BR 9705676 A, US 6291204 B1, CN 1184159 A, US 20030022273 A1, EP 872554 B1, DE 69722766 E, US 6677134 B2, US 20040058410 A1

L9: Entry 4 of 4

File: DWPI

Mar 1, 2004

DERWENT-ACC-NO: 1998-391048

DERWENT-WEEK: 200426

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TITLE: Preparation of carotenoid - comprises fermentation with transformed cell

INVENTOR: PASAMONTES, L; TSYGANKOV, Y

PRIORITY-DATA: 1996EP-0810839 (December 2, 1996)

## PATENT-FAMILY:

PUB-NO	PUB-DATE	LANGUAGE	PAGES	MAIN-IPC
<u>ES 2200110 T3</u>	March 1, 2004		000	C12N015/52
<u>JP 10155497 A</u>	June 16, 1998		080	C12N015/09
<u>EP 872554 A2</u>	October 21, 1998	E	000	C12N015/52
<u>BR 9705676 A</u>	May 25, 1999		000	C12N001/21
<u>US 6291204 B1</u>	September 18, 2001		000	C12P023/00
<u>CN 1184159 A</u>	June 10, 1998		000	C12P023/00
<u>US 20030022273 A1</u>	January 30, 2003		000	C12P023/00
<u>EP 872554 B1</u>	June 11, 2003	E	000	C12N015/52
<u>DE 69722766 E</u>	July 17, 2003		000	C12N015/52
<u>US 6677134 B2</u>	January 13, 2004		000	C12P023/00
<u>US 20040058410 A1</u>	March 25, 2004		000	C12P023/00

INT-CL (IPC): A23 J 3/20; A23 K 1/16; A23 L 1/03; A23 L 1/275; A23 L 1/30; C07 H 21/04; C12 N 1/21; C12 N 9/00; C12 N 9/02; C12 N 9/10; C12 N 9/14; C12 N 9/88; C12 N 15/09; C12 N 15/52; C12 N 15/70; C12 N 15/74; C12 N 15/80; C12 P 23/00; C12 R 1/20; C12 N 15/09; C12 R 1:20; C12 N 15/09; C12 R 1:05; C12 N 1/21; C12 R 1:19; C12 N 1/21; C12 R 1:125; C12 N 9/02; C12 R 1:19; C12 N 9/02; C12 R 1:125; C12 N 9/14; C12 R 1:19; C12 N 9/14; C12 R 1:125; C12 N 9/88; C12 R 1:19; C12 N 9/88; C12 R 1:125

ABSTRACTED-PUB-NO: JP 10155497A

BASIC-ABSTRACT:

Preparation of carotenoid pigments e.g. canthaxanthins using a cell transformed by a DNA sequence containing a DNA sequence or a vector having DNA sequences (a) to (e) or there substantially homologous sequences.

(a) a DNA sequence (crtE) coding GGPP synthase of Flavobacterium sp. R1534;

- (b) a DNA sequence (crtB) coding prephytoene synthase of Flavobacterium sp. R1534;  
(c) a DNA sequence (crtI) coding phytoene desaturase of Flavobacterium sp. R1534;  
(d) a DNA sequence (crtY) coding lycopene cyclase of Flavobacterium sp. R1534, and  
(e) a DNA sequence (crtW2396) coding beta -carotene beta -oxygenase of a microbe E-396 (FERM BP-4283).

Canthaxanthin is separated from the cell or the medium by a known method.

Also claimed is a method for the preparation of a food comprising a carotenoid or a carotenoid mixture.

ADVANTAGE - The method is an improved method of fermentation for carotenoid production.

ABSTRACTED-PUB-NO:

US 6291204B EQUIVALENT-ABSTRACTS:

Preparation of carotenoid pigments e.g. canthaxanthins using a cell transformed by a DNA sequence containing a DNA sequence or a vector having DNA sequences (a) to (e) or there substantially homologous sequences.

- (a) a DNA sequence (crtE) coding GGPP synthase of Flavobacterium sp. R1534;  
(b) a DNA sequence (crtB) coding prephytoene synthase of Flavobacterium sp. R1534;  
(c) a DNA sequence (crtI) coding phytoene desaturase of Flavobacterium sp. R1534;  
(d) a DNA sequence (crtY) coding lycopene cyclase of Flavobacterium sp. R1534, and  
(e) a DNA sequence (crtW2396) coding beta -carotene beta -oxygenase of a microbe E-396 (FERM BP-4283).

Canthaxanthin is separated from the cell or the medium by a known method.

Also claimed is a method for the preparation of a food comprising a carotenoid or a carotenoid mixture.

ADVANTAGE - The method is an improved method of fermentation for carotenoid production.

Full	Title	Citation	Front	Review	Classification	Date	Reference			Claims	KINC	Draw D
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### Search Results - Record(s) 1 through 6 of 6 returned.

☐ 1. Document ID: US 6677134 B2

L2: Entry 1 of 6

File: USPT

Jan 13, 2004

US-PAT-NO: 6677134

DOCUMENT-IDENTIFIER: US 6677134 B2

TITLE: Fermentative carotenoid production

DATE-ISSUED: January 13, 2004

## INVENTOR-INFORMATION:

NAME	CITY	STATE	ZIP CODE	COUNTRY
Pasamontes; Luis	Trimbach			CH
Tsygankov; Yuri	Moscow			RU

US-CL-CURRENT: 435/67; 435/183, 435/189, 435/232, 435/252.3, 435/252.33, 435/254.1, 536/23.2

## ABSTRACT:

Novel proteins of microorganism E-396 (FERM BP-4283) and the DNA sequences which encode these proteins have been discovered to provide an improved biosynthetic pathway from farnesyl pyrophosphate and isopentyl pyrophosphate to various carotenoids, especially zeaxanthin, astaxanthin, adonixanthin and canthaxanthin.

6 Claims, 89 Drawing figures

Exemplary Claim Number: 1

Number of Drawing Sheets: 87

Full	Title	Citation	Front	Review	Classification	Date	Reference			Claims	KMC	Draw D
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☐ 2. Document ID: US 6613543 B2

L2: Entry 2 of 6

File: USPT

Sep 2, 2003

US-PAT-NO: 6613543

DOCUMENT-IDENTIFIER: US 6613543 B2

TITLE: Fermentative carotenoid production

DATE-ISSUED: September 2, 2003



## INVENTOR-INFORMATION:

NAME	CITY	STATE	ZIP CODE	COUNTRY
Hohmann; Hans-Peter	Freiburg			DE
Pasamontes; Luis	Trimbach			CH
Tessier; Michel	Mulhouse			FR
van Loon; Adolphus	Rheinfelden			CH

US-CL-CURRENT: 435/67; 435/252.3, 435/252.33, 435/320.1, 536/23.2, 536/23.7

## ABSTRACT:

Novel proteins of Flavobacterium sp. R1534 and the DNA sequences which encode these proteins are disclosed which provide an improved biosynthetic pathway from farnesyl pyrophosphate and isopentyl pyrophosphate to various carotenoid precursors and carotenoids, especially .beta.-carotene, lycopene, zeaxanthin and cantaxanthin.

8 Claims, 92 Drawing figures

Exemplary Claim Number: 1

Number of Drawing Sheets: 92

Full	Title	Citation	Front	Review	Classification	Date	Reference			Claims	KMC	Draw. De
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☐ 3. Document ID: US 6291204 B1

L2: Entry 3 of 6

File: USPT

Sep 18, 2001

US-PAT-NO: 6291204

DOCUMENT-IDENTIFIER: US 6291204 B1

**\*\* See image for Certificate of Correction \*\***

TITLE: Fermentative carotenoid production

DATE-ISSUED: September 18, 2001

## INVENTOR-INFORMATION:

NAME	CITY	STATE	ZIP CODE	COUNTRY
Pasamontes; Luis	Trimbach			CH
Tsygankov; Yuri	Moscow			RU

US-CL-CURRENT: 435/67; 435/132, 435/155, 435/252.33, 536/23.2

## ABSTRACT:

Novel proteins of microorganism E-396 (FERM BP-4283) and the DNA sequences which encode these proteins have been discovered to provide an improved biosynthetic pathway from farnesyl pyrophosphate and isopentyl pyrophosphate to various carotenoids, especially zeaxanthin, astaxanthin, adonixanthin and canthaxanthin.

3 Claims, 88 Drawing figures

Exemplary Claim Number: 1

Number of Drawing Sheets: 87

Full	Title	Citation	Front	Review	Classification	Date	Reference			Claims	KWC	Draw. De
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☐ 4. Document ID: US 6207409 B1

L2: Entry 4 of 6

File: USPT

Mar 27, 2001

US-PAT-NO: 6207409

DOCUMENT-IDENTIFIER: US 6207409 B1

TITLE: Fermentative carotenoid production

DATE-ISSUED: March 27, 2001

## INVENTOR-INFORMATION:

NAME	CITY	STATE	ZIP CODE	COUNTRY
Hohmann; Hans-Peter	Frieburg			DE
Pasamontes; Luis	Trimbach			CH
Tessier; Michel	Mulhouse			FR
van Loon; Adolphus	Rheinfelden			CH

US-CL-CURRENT: 435/67; 435/132, 435/147, 435/148, 435/166, 435/183, 435/252.3,  
435/252.33, 536/23.2, 536/23.7

## ABSTRACT:

Novel proteins of Flavobacterium sp. R1534 and the DNA sequences which encode these proteins are disclosed which provide an improved biosynthetic pathway from farnesyl pyrophosphate and isopentyl pyrophosphate to various carotenoid precursors and carotenoids, especially .beta.-carotene, lycopene, zeaxanthin and cantaxanthin.

24 Claims, 93 Drawing figures

Exemplary Claim Number: 1

Number of Drawing Sheets: 92

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Full	Title	Citation	Front	Review	Classification	Date	Reference			Claims	KWC	Draw. De
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☐ 5. Document ID: US 6124113 A

L2: Entry 5 of 6

File: USPT

Sep 26, 2000

US-PAT-NO: 6124113

DOCUMENT-IDENTIFIER: US 6124113 A

**\*\* See image for Certificate of Correction \*\***

TITLE: Fermentative carotenoid production

DATE-ISSUED: September 26, 2000

## INVENTOR-INFORMATION:

NAME	CITY	STATE	ZIP CODE	COUNTRY
Hohmann; Hans-Peter	Freiburg			DE
Pasamontes; Luis	Trimbach			CH
Tessier; Michel	Mulhouse			FR
van Loon; Adolphus	Rheinfelden			CH

US-CL-CURRENT: 435/67; 435/183, 435/252.3, 435/252.33, 435/320.1, 435/410,  
536/23.2, 536/23.7

## ABSTRACT:

Novel proteins of Flavobacterium sp. R1534 and the DNA sequences which encode these proteins are disclosed which provide an improved biosynthetic pathway from farnesyl pyrophosphate and isopentyl pyrophosphate to various carotenoid precursors and carotenoids, especially .beta.-carotene, lycopene, zeaxanthin and cantaxanthin. Processes are also provided for preparing zeaxanthin by culturing a transformed host cell containing an expression cassette that includes a polynucleotide having a DNA sequence which encodes the GGPP synthase of Flavobacterium sp. R1534 (crtE), the prephytoene synthase of Flavobacterium sp. R1534 (crtB), the phytoene desaturase of Flavobacterium sp. R1534 (crtI), the lycopene cyclase of Flavobacterium sp. R1534 (crtY), or the .beta.-carotene hydroxylase of Flavobacterium sp. R1534 (crtZ). The polynucleotide is substantially free of other polynucleotides of Flavobacterium sp. R1534. The process further includes isolating the zeaxanthin from such cells or the culture medium.

6 Claims, 57 Drawing figures

Exemplary Claim Number: 1

Number of Drawing Sheets: 92

Full	Title	Citation	Front	Review	Classification	Date	Reference		Claims	KMAC	Draw Dg
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☐ 6. Document ID: US 6087152 A

L2: Entry 6 of 6

File: USPT

Jul 11, 2000

US-PAT-NO: 6087152

DOCUMENT-IDENTIFIER: US 6087152 A

**\*\* See image for Certificate of Correction \*\***

TITLE: Fermentative carotenoid production

DATE-ISSUED: July 11, 2000

## INVENTOR-INFORMATION:

NAME	CITY	STATE	ZIP CODE	COUNTRY
Hohmann; Hans-Peter	Freiburg			DE
Pasamontes; Luis	Trimbach			CH
Tessier; Michel	Mulhouse			FR
van Loon; Adolphus	Rheinfelden			CH

US-CL-CURRENT: 435/252.31; 435/183, 435/189, 435/232, 435/233, 435/252.3,  
435/252.33, 435/320.1, 536/23.1, 536/23.2, 536/23.7

## ABSTRACT:

Novel proteins of Flavobacterium sp. R1534 and the DNA sequences which encode these proteins are disclosed which provide an improved biosynthetic pathway from farnesyl pyrophosphate and isopentyl pyrophosphate to various carotenoid precursors and carotenoids, especially .beta.-carotene, lycopene, zeaxanthin and cantaxanthin.

73 Claims, 58 Drawing figures

Exemplary Claim Number: 61

Number of Drawing Sheets: 92

Full	Title	Citation	Front	Review	Classification	Date	Reference	Claims	KMC	Draw D
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